

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, CA 94035-0001



Reply to Attn of: JAI: 241-1

DATE: November 8, 2013
TO: Potential Offerors
FROM: Contracting Officer, NASA Ames Research Center (ARC)
SUBJECT: RFQ# NNA14489731Q-AMD

Attached is Request for Quotes (RFQ) # NNA14489731Q-AMD for Carbon Fabric Stitch Development. This requirement is being conducted under Simplified Acquisition Procedures for non-commercial items, in accordance with FAR Part 13.

The following documents are posted for your review to enable your preparation of a quotation to be submitted to NASA ARC in response to this RFQ:

- 1) Solicitation Instructions, Provisions and Clauses (follows this letter)
- 2) Statement of Work (page 11) and Milestones Payment Schedule (page 14)

All contractual and/or technical questions must be submitted via e-mail by 4:00 pm Pacific time November 20, 2013. Telephone questions will not be accepted. Please address any comments or questions to: Marianne Shelley, Email: Marianne.Shelley@nasa.gov. Any responses to questions submitted will be posted as an amendment to this RFQ at this website.

Offers for the items and services described in this RFQ (**quotations**) are **due no later than 4:00 pm Pacific time December 2, 2013** and shall be delivered to Marianne Shelley, by EMAIL to Marianne.Shelley@nasa.gov. Offers must be in MS Office and/or Adobe pdf file formats. Offers must include all of the required information as indicated on the following pages.

Cordially,

Contracting Officer
NASA Ames Research Center

TABLE OF CONTENTS

A.	INSTRUCTIONS TO OFFERORS.....	1
1.	<i>Cover letter</i>	<i>1</i>
2.	<i>Price.....</i>	<i>1</i>
3.	<i>Technical Capability.....</i>	<i>1</i>
4.	<i>Past Experience</i>	<i>1</i>
B.	SOLICITATION PROVISIONS	2
1.	<i>Protests to NASA (1852.233-70 (OCT 2002)</i>	<i>2</i>
2.	<i>Evaluation - Other Than Commercial Items (1852.213-71) (JUN 2002)</i>	<i>2</i>
3.	<i>Patent Rights Clauses. (1852.227-84) DEC 1989.....</i>	<i>3</i>
C.	TERMS AND CONDITIONS OF ORDER (GENERAL - OTHER THAN COMMERCIAL ITEMS)	4
1.	<i>Clauses Incorporated by Reference (FAR 52.252-2) (FEB 1998).....</i>	<i>4</i>
2.	<i>1852.215-84 Ombudsman. (NOV 2011).....</i>	<i>5</i>
3.	<i>1852.225-70 Export Licenses. (FEB 2000).....</i>	<i>5</i>
4.	<i>1852.227-72 Designation of New Technology Representative and Patent Representative (JUL 1997)</i>	<i>6</i>
5.	<i>1852.247-72 Advance Notice of Shipmen (OCT 1988)</i>	<i>6</i>
6.	<i>ARC 52.227-93 Management and Protection of Data (JUL 1988)</i>	<i>7</i>
7.	<i>ARC 52.227-96 Handling of Data (JUN 1989)</i>	<i>7</i>
8.	<i>ARC 52.227-97 Subcontracting and Data Rights (OCT 2006).....</i>	<i>8</i>
9.	<i>SUBMISSION OF INVOICES (ARC 52.232-90) (JUN 2008) (MODIFIED JAN 2012)</i>	<i>8</i>
10.	<i>PERIOD OF PERFORMANCE</i>	<i>9</i>
11.	<i>PLACE OF PERFORMANCE.....</i>	<i>9</i>
12.	<i>DELIVERY INSTRUCTIONS</i>	<i>9</i>
13.	<i>DELIVERY AND/OR COMPLETION SCHEDULE</i>	<i>10</i>
14.	<i>REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFEROR (SIMPLIFIED ACQUISITIONS).....</i>	<i>10</i>
D.	ORDER DOCUMENTS, EXHIBITS OR ATTACHMENTS	11
	STATEMENT OF WORK.....	11
E.	MILESTONES PAYMENT SCHEDULE (OFFEROR TO COMPLETE)	14

A. INSTRUCTIONS TO OFFERORS

Each quotation package submitted by the offeror in response to this RFQ shall contain the following information:

1. Cover letter

Include a brief cover letter that includes the following information:

- a) A statement of acceptance of the purchase order provisions and clauses, and proposed schedule, or specific exceptions taken to any of the terms and conditions. Include a written acknowledgement of all solicitation amendments, if any.
- b) A statement that your company's proposal is firm for a period of not fewer than 60 days.
- c) Includes the names, telephone numbers, and email addresses of persons to be contacted for technical and contractual questions.
- d) Company DUNS and Cage Code numbers (all offerors must be currently registered in the System for Award Management, www.sam.gov) . Offerors shall verify that their company has completed the Annual Representations and Certifications electronically via the SAM website, and that the certifications are current.
- e) Letter shall be signed by an official authorized to contractually bind your company.

All offers will be evaluated for Price, Technical Capability, and Past Experience as detailed below:

2. Price

Complete the "Milestones Payment Schedule on page 14 of this solicitation, providing a firm fixed price for each of the tasks described in the Statement of Work (SOW) (page 11).

3. Technical Capability

(7 pages maximum) Offerors shall submit a written document that describes the technical capability of the offeror to successfully perform the work described in the SOW. Describe the following:

1. Offeror's facilities and equipment that will enable successful performance.
2. Names of key personnel who will be performing the SOW, their qualifications/ education, years of experience, resumes, etc.

4. Past Experience

(10 pages maximum) Offerors shall submit relevant information that describes the offeror's past experience joining woven carbon fabric, including the following:

1. Extent the vendor has sewn with high modulus fiber yarns.
2. Extent the vendor has previously performed high temperature testing (>800 C) of fabrics or stitched joints.
3. Include a list of 3 relevant contracts which demonstrate the offeror's capabilities to perform this requirement. Include the contract numbers; Government agency or industry placing the contract; Contracting Officer's email address; dates of performance, and a brief description of offeror's part of the work and the total dollar value of the offeror's portion.

B. SOLICITATION PROVISIONS

1. Protests to NASA (1852.233-70 (OCT 2002))

Potential bidders or offerors may submit a protest under 48 CFR Part 33 (FAR Part 33) directly to the Contracting Officer. As an alternative to the Contracting Officer's consideration of a protest, a potential bidder or offeror may submit the protest to the Assistant Administrator for Procurement, who will serve as or designate the official responsible for conducting an independent review. Protests requesting an independent review shall be addressed to Assistant Administrator for Procurement, NASA Code H, Washington, DC 20546-0001.

(End of provision)

2. Evaluation - Other Than Commercial Items (1852.213-71) (JUN 2002)

- (a) The Government will award a contract resulting from this solicitation to the responsible offeror whose offer conforming to the solicitation will be most advantageous to the Government, price and other factors considered. The following factors shall be used to evaluate offers:

- 1) Price: Price reasonableness of the quoted firm fixed price for Task 3.1 and Option Task 3.2.
- 2) Technical capability of offeror:
 - a. Evaluation of Offeror's facilities and equipment that will enable successful performance.
 - b. Evaluation of key personnel who will be performing the SOW, their qualifications/ education, years of experience, etc.
 - c. Evaluation of the offeror's capability to perform both SOW Task 3.1 and Option Task 3.2.
- 3) Past experience:
 - a. Evaluation of the extent the vendor has previously sewn with high modulus fiber yarns.
 - b. Evaluation of the extent the vendor has previously performed high temperature testing (>800 C) of fabrics or stitched joints.
 - c. Evaluation of contractor's performance on similar government/NASA/ industry contracts.
 - d. Responsibility of the vendor.

(b) Options: The Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. The Government may determine that an offer is unacceptable if the option prices are significantly unbalanced. Evaluation of options shall not obligate the Government to exercise the option(s).

(End of provision)

3. Patent Rights Clauses. (1852.227-84) DEC 1989

This solicitation contains the patent rights clauses of [FAR 52.227-11](#) (as modified by the NFS) and [NFS 1852.227-70](#). If the contract resulting from this solicitation is awarded to a small business or nonprofit organization, the clause at NFS 1852.227-70 shall not apply. If the award is to other than a small business or nonprofit organization, the clause at [FAR 52.227-11](#) shall not apply.

(End of Provision)

C. TERMS AND CONDITIONS OF ORDER (GENERAL - OTHER THAN COMMERCIAL ITEMS)

Open Market Supply or Service: This is an order for a non-commercial item or service subject to the terms and conditions of **FAR 52.213-4, Terms and Conditions - Simplified Acquisitions (Other Than Commercial Items) (JUL 2013)**, incorporated by reference, and any additional terms and conditions incorporated by reference or included in full text as indicated below.

1. Clauses Incorporated by Reference (FAR 52.252-2) (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

Federal Acquisition Regulation (FAR) clauses:

<http://www.acquisition.gov/>

NASA FAR Supplement (NFS) clauses:

<http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>

This order incorporates the following FAR and NASA FAR Supplement (NFS) clauses by reference. **See paragraph (c) of FAR 52.213-4.**

(End of clause)

FEDERAL ACQUISITION REGULATION (48 CFR CHAPTER 1)		
52.213-4	JUL 2013	Terms and Conditions - Simplified Acquisitions (Other Than Commercial Items)
52.217-7	MAR 1989	Option for Increased Quantity – Separately Priced Line item, insert “2 weeks”,
52.217-9	MAR 2000	Option to Extend the Term of the Contract, insert “2 weeks”, “30 days”, “2 years”
52.227-1	DEC 2007	Authorization and Consent
52.227-2	DEC 2007	Notice and Assistance Regarding Patent and Copyright Infringement
52.227-11	DEC 2007	Patent Rights--Ownership by the Contractor
52.227-14	DEC 2007	Rights in Data – General (DEC 2007)(ALT II) (<i>Insert:</i> <ul style="list-style-type: none"> • Use (except for manufacture) by support service contractors. • Evaluation by nongovernment evaluators. • Use (except for manufacture) by other contractors participating in the Government’s program of which the specific contract is part. <i>at the end of paragraph(a))</i> (DEC 2007) (ALT III) (DEC 2007)(ALT V)(DEC 2007) (AS MODIFIED BY NFS 1852.227-14, RIGHTS IN DATA – GENERAL)

52.227-16	JUN 1987	Additional Data Rights
52.246-9	APR 1984	Inspection of Research and Development (Short Form)
52.247-34	NOV 1991	FOB Destination

NASA FAR SUPPLEMENT (48 CFR CHAPTER 18)		
1852.223-72	APR 2002	Safety and Health (Short Form)
1852.227-11		Patent Rights—Retention by the Contractor (Short Form) (Modifies FAR Clause 52.227-11)
1852.227-70	MAY 2002	New Technology (applies to other than small business or non-profit)
1852.235-73	DEC 2006	Final Scientific and Technical Reports
1852.237-73	JUN 2005	Release of Sensitive Information

2. 1852.215-84 Ombudsman. (NOV 2011)

- (a) An ombudsman has been appointed to hear and facilitate the resolution of concerns from offerors, potential offerors, and contractors during the preaward and postaward phases of this acquisition. When requested, the ombudsman will maintain strict confidentiality as to the source of the concern. The existence of the ombudsman is not to diminish the authority of the contracting officer, the Source Evaluation Board, or the selection official. Further, the ombudsman does not participate in the evaluation of proposals, the source selection process, or the adjudication of formal contract disputes. Therefore, before consulting with an ombudsman, interested parties must first address their concerns, issues, disagreements, and/or recommendations to the contracting officer for resolution.
- (b) If resolution cannot be made by the contracting officer, interested parties may contact the installation ombudsman, whose name, address, telephone number, facsimile number, and e-mail address may be found at: http://prod.nais.nasa.gov/pub/pub_library/Omb.html

Concerns, issues, disagreements, and recommendations which cannot be resolved at the installation may be referred to the Agency ombudsman identified at the above URL. Please do not contact the ombudsman to request copies of the solicitation, verify offer due date, or clarify technical requirements. Such inquiries shall be directed to the Contracting Officer or as specified elsewhere in this document.

3. 1852.225-70 Export Licenses. (FEB 2000)

- (a) The Contractor shall comply with all U.S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120 through 130, and the Export Administration Regulations (EAR), 15 CFR Parts 730 through 799, in the performance of this contract. In the absence of available license exemptions/exceptions, the Contractor shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of hardware, technical data, and software, or for the provision of technical assistance.
- (b) The Contractor shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of this contract, including instances where the work is to be performed on-site at NASA Ames Research Center, where the foreign person will have access to export-controlled technical data or software.

(c) The Contractor shall be responsible for all regulatory record keeping requirements associated with the use of licenses and license exemptions/exceptions.

(d) The Contractor shall be responsible for ensuring that the provisions of this clause apply to its subcontractors.

(End of clause)

4. 1852.227-72 Designation of New Technology Representative and Patent Representative (JUL 1997)

(a) For purposes of administration of the clause of this contract entitled "New Technology" or "Patent Rights--Retention by the Contractor (Short Form)," whichever is included, the following named representatives are hereby designated by the Contracting Officer to administer such clause:

TITLE	OFFICE CODE	ADDRESS (INCLUDING ZIP CODE)
New Technology Representative	VP	NASA Ames Research Center M/S 202A-3 P.O. Box 1 Moffett Field, CA 94035-0001
Patent Representative	DL	NASA Ames Research Center M/S 202A-4 P.O. Box 1 Moffett Field, CA 94035-0001

(b) Reports of reportable items, and disclosure of subject inventions, interim reports, final reports, utilization reports, and other reports required by the clause, as well as any correspondence with respect to such matters, should be directed to the New Technology Representative unless transmitted in response to correspondence or request from the Patent Representative. Inquiries or requests regarding disposition of rights, election of rights, or related matters should be directed to the Patent Representative. This clause shall be included in any subcontract hereunder requiring a "New Technology" clause or "Patent Rights--Retention by the Contractor (Short Form)" clause, unless otherwise authorized or directed by the Contracting Officer. The respective responsibilities and authorities of the above-named representatives are set forth in 1827.305-370 of the NASA FAR Supplement.

(End of clause)

5. 1852.247-72 Advance Notice of Shipmen (OCT 1988)

Five (5) work days prior to shipping stitch samples the Contractor shall furnish the anticipated shipment date, bill of lading number (if applicable), and carrier identity to [TBD] and to the Contracting Officer.

(End of clause)

6. ARC 52.227-93 Management and Protection of Data (JUL 1988)

- (a) In the performance of this contract it is anticipated that the Contractor may have access to, be furnished, use, or generate the following types of data (recorded information):
- (1) data submitted to the Government with limited rights or restricted rights notices;
 - (2) data of third parties which the Government has agreed to handle under protective arrangements; and
 - (3) data generated by or on behalf of the Government which the Government intends to control the use and dissemination thereof.
- (b) In order to provide management appropriate for protecting the interests of the Government and other owners of such data, the Contractor agrees with respect to data in category (a)(1) above, and with respect to any data in categories (a)(2) and (a)(3) when so identified by the Contracting Officer, to:
- (1) use and disclose such data only to the extent necessary to perform the work required under this contract, with particular emphasis on restricting disclosure of the data to those persons who have a definite need for the data in order to perform under this contract;
 - (2) not reproduce the data unless reproduction of the data is specifically permitted elsewhere in the contract or by the Contracting Officer;
 - (3) refrain from disclosing the data to third parties without the written consent of the Contracting Officer; and
 - (4) return or deliver the data including all copies thereof to the Contracting Officer or his designated recipient when requested by the Contracting Officer.

(End of clause)

7. ARC 52.227-96 Handling of Data (JUN 1989)

- (a) Paragraph (d)(1) of the "Rights in Data--General" clause of this contract permits the Government to restrict the Contractor's right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of the contract provided such restriction is expressly set forth in the contract. Pursuant to this authority, the following restrictions shall apply to such data and shall be included, in substance, in all subcontracts:
- (b) Data specifically used.
- (1) In the performance of this contract, it is anticipated the Contractor may have access, or be furnished, data (including financial, administrative, cost or pricing, or management information as well as technical data or computer software) of third parties which the Government has agreed to handle under protective arrangements, as well as such Government data for which the Government intends to control the use and dissemination.
 - (2) In order to protect the interests of the Government and the owners of such data, the Contractor agrees, with respect to such third party or Government data that is either marked with a restrictive legend or specifically identified in this contract or in writing by the Contracting Officer as being subject to this clause, to use and disclose such data only

to the extent necessary to perform the work required under this contract, preclude disclosure of such data outside the Contractor's organization, and return or dispose of such data as directed by the Contracting Officer when the data is no longer needed for contract performance.

(3) Notwithstanding (2) above, the Contractor shall not be restricted in the use and disclosure of any data that becomes generally available without breach of this clause by this Contractor, is known to or is developed by the Contractor independently of any disclosure of proprietary, restricted, or confidential data hereunder, or is rightfully received by the Contractor from a third party without restriction.

(c) Data first produced.

Data first produced by the Contractor under this contract may include data for which the Government wants to control the use and dissemination. The Contracting Officer may require, or this contract may presently specify, that the Contractor apply restrictive legends to such identified data prior to delivery to the Government, or to third parties at the Government's direction, that restrict the use and disclosure of the data by any third party recipient. However, such restrictive legends shall in no way affect the Contractor's or the Government's rights to such data as provided in the "Rights in Data--General" clause of this contract.

(End of clause)

8. ARC 52.227-97 Subcontracting and Data Rights (OCT 2006)

(a) It is strongly recommended that the Contractor flow down the data rights provisions of this contract to lower tier subcontractors to ensure that it can fulfill its data rights obligations to the Government. See Clause FAR 52.227-14(h), *Rights in Data—General*. The Contractor shall be held responsible to obtain rights for the Government where it fails to fulfill such obligations.

(b) Pursuant to Clause FAR 52.227-14(c)(2), the Contractor must obtain Contracting Officer approval before incorporating any data not first produced under the Contract into data delivered under the contract. Before delivering such data, the Contractor must identify it and grant the Government, or acquire on its behalf, the broad licenses required by subparagraph (c) of the *Rights in Data—General* clause.

(End of clause)

9. SUBMISSION OF INVOICES (ARC 52.232-90) (JUN 2008) (MODIFIED JAN 2012)

(a) Invoices shall be prepared and submitted to the designated billing and payment office noted below in accordance with FAR 52.232.25 Prompt Payment clause:

NASA Shared Services Center (NSSC)
Financial Management Division (FMD)—Accounts Payable
Bldg. 1111, Road C
Stennis Space Center, MS 39529

Invoices shall include the Contractor's Taxpayer Identification Number (TIN). Electronic submission is preferred, via email NSSC-AccountsPayable@nasa.gov or fax 866-209-5415. A copy of the invoice shall be provided to the Contracting Officer.

(b) In the event that amounts are withheld from payment in accordance with the New

Technology clause or other provisions of this contract, a separate invoice for the amount withheld shall be required before payment of that amount is made.

(c) This Contract ☒ does ☐ does not provide for partial payments. If applicable, payments will be made in accordance with the following schedule:

Payment will be made for separately priced items or services which have been received and accepted by NASA, and upon receipt of a payable invoice submitted in accordance with this clause.

(End of clause)

10. PERIOD OF PERFORMANCE

The period of performance of this contract is from: **date of award through TBD.**

(End of clause)

11. PLACE OF PERFORMANCE

The services to be performed under this contract shall be performed at the following location(s):
(1) the Contractor's facilities at _____ TBD _____ and at other locations as directed by the Contracting Officer.

(End of clause)

12. DELIVERY INSTRUCTIONS

(a) The Contractor shall ship the items required under this contract to:

NASA Ames Research Center
M/S 255-3
Moffett Field, CA 94035-0001
Marked for:

Consignee: TBD
Contract Number: TBD
Organization/Office Code: TBD
Building No.: TBD

(b) Unless otherwise authorized in advance by the Contracting Officer, deliveries under this contract shall be made between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday, excluding Federal holidays.

(c) Additional delivery instructions:
None

(d) Additional marking instructions:
None

(End of clause)

13. DELIVERY AND/OR COMPLETION SCHEDULE

The Contractor shall deliver and/or complete performance of the items required under this contract as follows in accordance with the following schedule:

Task	Due Date	Description	Firm Fixed Price	Acceptance Criteria
3.1 Carbon Thread Stitching Design Trade Study				
3.1.1	TBD	Attendance and participation at Kick-off meeting with NASA	\$	Acceptance by COR/CO
3.1.2	TBD	Delivery of preliminary results for 5 candidate stitch designs, a summary report on difficulties encountered and progress achieved, provide 3 load test samples for each candidate stitch design	\$	Acceptance by COR/CO
3.1.3	TBD	Delivery of 10 test samples for each of 2 downselected stitch designs	\$	Acceptance by COR/CO
3.1.4	TBD	Delivery of Preliminary Data Package per SOW 4.2		Acceptance by COR/CO
		TOTAL FIRM FIXED PRICE Base Task	\$	
3.2 Stitch Scalability and Testing Development (OPTION, IF EXERCISED)				
3.2.1	TBD	Delivery of samples of seams that are no more than 2 m long, with 10 layers “incrementally” stitched. (2 samples for each of 2 stitch patterns)	\$	Acceptance by COR/CO
3.2.2	TBD	Delivery of Final Data Package (FDP) per SOW 4.2	\$	Acceptance by COR/CO
		TOTAL FIRM FIXED PRICE Optional Task 3.2, IF EXERCISED	\$	

(End of clause)

14. REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFEROR (SIMPLIFIED ACQUISITIONS)

The completed provision 52.204-8, Annual Representations and Certifications, including any amended representation(s) made at paragraph (b) of the provision submitted as part of the quote are hereby incorporated by reference in this resulting order.

(End of Clause)

D. ORDER DOCUMENTS, EXHIBITS OR ATTACHMENTS

STATEMENT OF WORK

TITLE: “Carbon Fabric Stitch Development”

1. INTRODUCTION/BACKGROUND

NASA is investigating the development of woven carbon fabrics for implementation in deployable aeroshells used in entry, descent and landing. The carbon fabric and the joints between fabric panels need to withstand the harsh aero-thermodynamic and aerodynamic loading environments imparted by high speed entries into planetary atmospheres. One of the key challenges facing the development of deployable aeroshells constructed from carbon cloth is the joining of gore sections to close-out the aeroshell structure and to interface with underlying rigid structural elements. In the deployed state, it is expected that the carbon fabric will be under substantial tensile loads (up to 300 lbf/in), and during hypersonic flight, aerodynamic loading could increase the tensile loading in the fabric to 650 lbf/in. It is essential that the stitching used to join gore sections be capable of maintaining integrity at high temperature (~ 3500 F), which suggests that carbon fiber threads will be needed. It is also important that multilayer fabrics can be stitched in incremental layers, so that failure of the top layer does not compromise the entire stack. However, stitching with carbon thread is challenging, as the handling and stress involved in the stitching process tends to adversely affect its structural properties, leading to low seam strength.

2. SCOPE OF WORK/OBJECTIVES

Developing reliable stitch methods would be a major contribution for the successful development of deployable aeroshells composed of carbon fabrics (thickness ranging from 0.05-0.20 inch). There are numerous parameters to investigate, including but not limited to thread type, seam type, stitch pattern/density, and sewing process variables. Evaluating the various stitch designs through load testing (performed by NASA), combined structural and aerothermal loading, and component interface tests should provide candidate designs to carry further along in the development process.

NASA may award one or more fixed price non-commercial purchase orders for this developmental effort. The total value of the awarded purchase orders is not expected to exceed \$100,000. Vendors shall provide a firm fixed price to perform Task 3.1 and a firm fixed price to perform Option Task 3.2.

3. TASK DESCRIPTIONS

3.1 Carbon Thread Stitching Design Trade Study (Task 3.1)

This study will investigate the feasibility of joining samples of woven carbon fabric using carbon fiber based sewing threads. Batches of small-scale carbon fabric samples (~3 inch

wide by 9 inch length) possessing the required design features will be evaluated and structural assessment parameters identified. Load testing of the various stitch and seam design concepts should lead to the identification of the key design parameters to further investigate. The outcome of this study will be the downselect of a primary and alternate stitch and seam design to carry forward for further testing and development.

Milestones

3.1.1 Kick-off meeting with NASA (within 1 month after purchase order award) to define fabric features to be used, the set of stitch patterns for preliminary assessment, and the dimensions of stitched coupons for load testing. NASA will define the metrics for ranking alternate designs. Kick-off meeting is planned to be via teleconference and attendance in person will not be required.

3.1.2 (3 months after receiving NASA provided carbon fabric samples) Contractor shall provide preliminary results for 5 candidate stitch designs, and a summary report on difficulties encountered and progress achieved. Contractor shall provide 3 load test samples for each candidate stitch design.

3.1.3 (2 months after downselect decision [after NASA load tests samples]) The contractor shall provide 10 test samples for each of 2 downselected stitch designs.

3.1.4 Contractor shall deliver a Preliminary Data Package that includes information on the yarn specifications (fiber type, denier, twist, supplier, etc.), lessons learned in sewing with candidate yarns, stitch types investigated, tooling, and primary sewing parameters investigated.

The period of performance for this task will be approximately six months, commencing upon purchase order award.

3.2 Stitch Scalability and Testing Development (Option Task 3.2)

If exercised, the goal of Task 3.2 is to investigate longer seams derived from the primary and alternate stitch designs identified in Task 3.1. The carbon fabric samples provided for this task will be representative of structural and aerothermal test models that will be used to evaluate the performance of the stitches in environments representative of flight. In addition, the identification of the key stitch design parameters along with test and evaluation methods found suitable to assess structural design quality will be identified.

Milestones

3.2.1 Contractor shall produce samples of seams that are no more than 2 m long, with 10 layers “incrementally” stitched. (2 samples for each of 2 stitch patterns).

3.2.2 Contractor shall deliver a Final Data Package (FDP) and report that includes scalability considerations (in thickness and seam length, infrastructure required, special tooling) and challenges anticipated to achieve desired test article design. The final report shall include estimation of maximum seam strength (as % of strength of woven fabric) and notes on handling and environment restrictions for the seams.

The period of performance for Task 3.2 will be approximately six months, commencing upon exercise of Option Task 3.2.

4 DELIVERABLES

4.1 Period of Performance

The period of performance is expected to not exceed 15 months for the entire effort (Tasks 3.1 and 3.2, if exercised).

4.2 Data Deliverables

The Preliminary and Final Data Package for each task will be delivered to NASA within thirty (30) days after task completion. The FDP will include an executive summary, nomenclature, test article photographs, and the design study data on electronic media. FDP shall include a report that includes scalability considerations (in thickness and seam length, infrastructure required, special tooling) and challenges anticipated to achieve desired test article design. The final report shall include estimation of maximum seam strength (as % of strength of woven fabric) and notes on handling and environment restrictions for the seams.

4.3 GOVERNMENT FURNISHED INFORMATION/PROPERTY

NASA will provide the carbon fabric articles for design, test and evaluation of various stitch designs. The carbon fabric samples will be approximately 3” wide by 9” long.

5 TESTING

After delivery of the stitch design samples, NASA will conduct a series of tests to characterize the ultimate tensile strength of various carbon fabric weaves and fabric samples that are joined together with various stitch designs. Characterizing the tensile properties will aid in the optimization of the aeroshell design. This test series will aid in the downselect of stitch designs to pursue for further development. NASA will retain rights to the stitch designs developed under these purchase orders, and they may be shared with other contractors and utilized in future development efforts. All NASA structural test data obtained from a vendor’s stitching samples will be shared with the vendor.

E. MILESTONES PAYMENT SCHEDULE (OFFEROR TO COMPLETE)

Task	Description	Firm Fixed Price (to be proposed)
3.1	Carbon Thread Stitching Design Trade Study	
3.1.1	Attendance and participation at Kick-off meeting with NASA	\$
3.1.2	Delivery of preliminary results for 5 candidate stitch designs, a summary report on difficulties encountered and progress achieved, provide 3 load test samples for each candidate stitch design	\$
3.1.3	Delivery of 10 test samples for each of 2 downselected stitch designs	\$
3.1.4	Delivery of Preliminary Data Package per SOW 4.2	\$
	TOTAL FIRM FIXED PRICE Base Task	\$
3.2	Stitch Scalability and Testing Development (option)	
3.2.1	Delivery of samples of seams that are no more than 2 m long, with 10 layers “incrementally” stitched. (2 samples for each of 2 stitch patterns)	\$
3.2.2	Delivery of Final Data Package (FDP) per SOW 4.2	\$
	TOTAL FIRM FIXED PRICE Optional Task 3.2, IF EXERCISED	\$